

## Executive Summary

### I. Section 305(b), Volume I

The 2010 Integrated Report (IR) on the condition of water resources in Kentucky is submitted to the U. S. Environmental Protection Agency (EPA) to fulfill requirements of sections 303(d), 305(b) and 314 of the Federal Water Pollution Control (or Clean Water) Act of 1972 (P.L. 92-500), as subsequently amended. Section 305(b) of the Act requires states to assess and report water quality conditions to EPA every two years. This is the third reporting cycle that the commonwealth has submitted the biennial report in the Integrated Report (IR) format. This reporting format provides categories to report assessment results per designated use of assessed water bodies, thus providing a convenient method to track water bodies and segments by designated use and assessment results. Below are the categories assessed water body designated uses are assigned (Table 1).

Table 1. Reporting categories assigned to surface waters during the assessment process.

| <u>Category</u> | <u>Definition</u>  |
|-----------------|--|
| 1               | All designated uses for water body fully supporting.   |
| 2               | Assessed designated use(s) is/are fully supporting, but not all designated uses assessed.  |
| 2B              | Segment currently supporting use(s), but 303(d) listed & proposed to EPA for delisting.  |
| 3               | Designated use(s) has/have not been assessed (insufficient or no data available).  |
| 4A              | Segment with an EPA approved or established TMDL for all listed uses not attaining full support.   |
| 4B              | Nonsupport segment with an approved alternative pollution control plan (e.g. BMP) stringent enough to meet full support level of all uses within a specified time.                           |
| 4C              | Segment is not meeting full support of assessed use(s), but this is not attributable to a pollutant or combination of pollutants.  |
| 5               | TMDL is required.  |
| 5B              | Segment does not support designated uses based on evaluated data, but based on Kentucky listing methodology insufficient data are available to make a listing determination. No TMDL needed. |

While this reporting cycle is comprehensive in that it provides a statewide update on water quality conditions of water bodies in all river basins, or BMUs (basin

management unit), the focus is on the Big Sandy-Little Sandy-Tygarts BMU and the Kentucky River BMU. There are five BMUs in the state: 1) Kentucky River; 2) Salt-Licking Rivers; 3) Upper Cumberland and 4-Rivers; 4) Green-Tradewater; and 5) Big Sandy-Little Sandy-Tygarts. Since 1998 the KDOW (Kentucky Division of Water) has executed a five-year rotating BMU monitoring strategy. This strategy has many advantages for the state to monitor and manage water resources, namely it focuses available resources to a particular BMU once every five years providing an in-depth assessment of water quality and issues specific to regional water resources.

The assessment results use three classifications to denote relative level of designated use support: fully supporting (good to excellent water quality); partially supporting (fair water quality, does not fully meet designated use); and nonsupporting (poor water quality).

The KDOW monitors wadeable and boatable waters and lakes or reservoirs. In the ambient water quality network all stations are monitored for a suite of conventional and toxic pollutants on a monthly or bimonthly frequency. Water quality stations in a given BMU are monitored monthly once every five years, and are otherwise monitored bimonthly four of five years. When the rotating BMU monitoring strategy was adopted the KDOW expanded the primary (permanent, regular monitored stations) water quality stations to 70 and added approximately 20 additional watershed water quality stations per BMU. This has provided greater coverage of water quality stations and the flexibility to add watershed stations for monitoring watersheds for particular reasons (e.g. landuse considerations, TMDL development, intra-basin issues) for each BMU. Many of the wadeable primary water quality stations are monitored for biological community health once every five years. The KDOW develops biological monitoring plans for wadeable streams including a reference network for development and refinement of biological metrics, and targeted monitoring to address needs and fill gaps in each BMU.

Probability-based monitoring design of wadeable streams (stream order 1 – 5) is employed in each BMU to provide a nonbiased assessment of water quality, laying the foundation for trends across the state. This random approach provides water quality data that is nonbiased and can be applied to many issues and water quality needs for the KDOW. For example, nutrient gradients and other water quality variables, and given the

nature of the data it is often a resource that can be drawn upon for new issues that may emerge. The TMDL section monitors water bodies and associated watersheds to scope the extent and verify sources of each pollutant affecting a 303(d) listed water body as part of TMDL development. Publicly owned lakes and reservoirs are monitored per BMU to determine current and trend water quality condition. A suite of physical and chemical variables are monitored three times during the growing season, spring, summer and fall. This interval provides data under the most environmentally stressful conditions when water quality may degrade due to pollutants and is most likely manifest.

### **Warmwater and Coldwater Aquatic Habitat Use Support – Streams**

#### **Statewide**

Kentucky has almost 92,000 miles of streams, many of these miles are small, 1<sup>st</sup> and 2<sup>nd</sup> order intermittent or perennial streams to the great rivers, the Ohio and the Mississippi that account for about 850 miles. To date, there are 9,967 miles (about 11 percent) assessed for coldwater and warmwater aquatic habitat designated uses (collectively often referred to as aquatic life use) of the approximately 92,000 miles. Of assessed miles, 5,167 (nearly 52 percent) fully support this designated use. The number of assessed miles not supporting these designated uses (often referred to collectively as aquatic life use) is about 4,800 miles, or 48 percent (Figure 1). Since the 2008 IR the number of miles not supporting aquatic life use has increased about one percent statewide. The three leading causes (pollutants) of impaired water quality for this designated use are sedimentation/siltation, nutrient/eutrophication and total dissolved solids. The percentage of stream miles monitored and assessed for this use is presented by major river basin in Figure 2.

Figure 1. Support level for total stream miles monitored by all methods for aquatic life use per the 2010 Integrated Report.

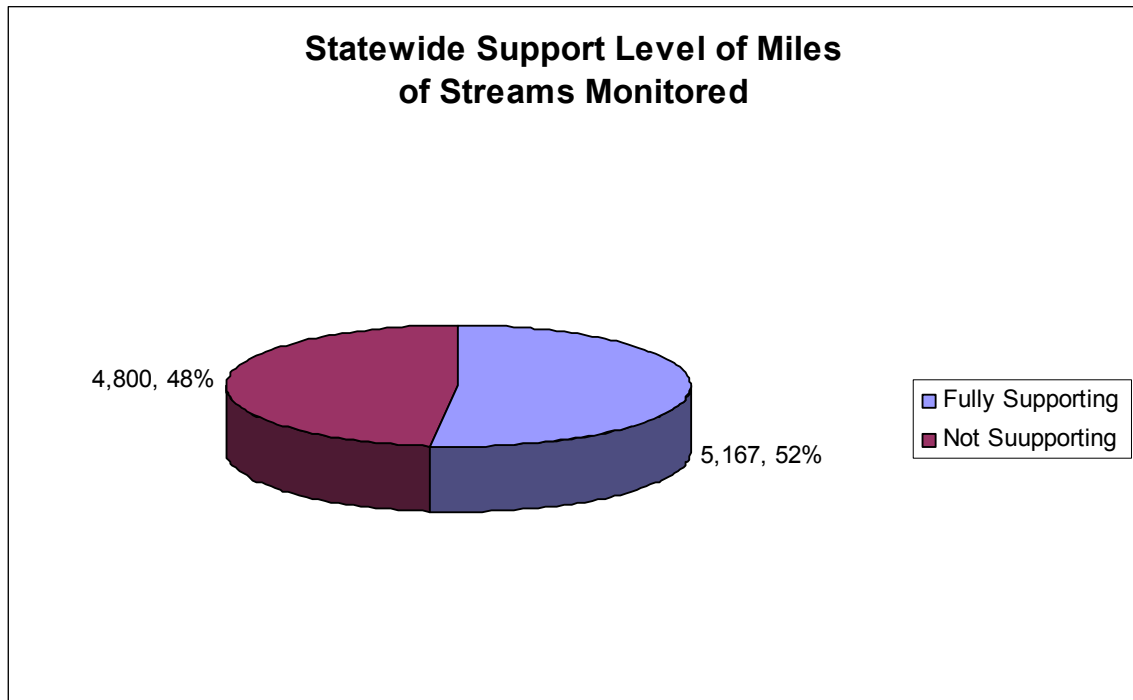
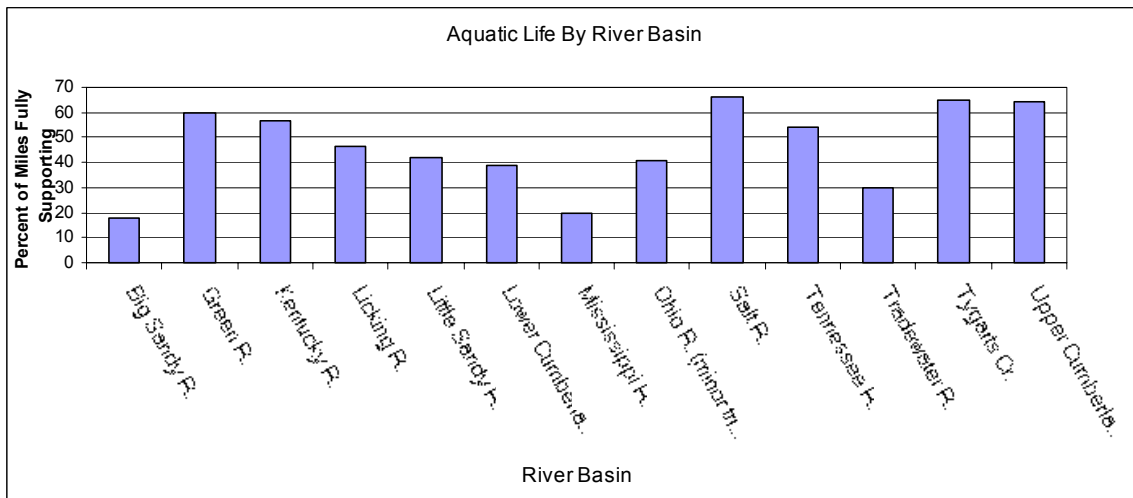


Figure 2. Percent of monitored fully supporting miles assessed for aquatic life use through the 2010 305(b) reporting cycle.



## Big Sandy-Little Sandy-Tygarts BMU

### Big Sandy River Basin

The Big Sandy River basin is the largest basin in this BMU, followed by the Little Sandy River and Tygarts Creek basins. There are 790 stream miles assessed in the Big Sandy River basin, with 141 miles (18 percent) fully supporting this use, 340 miles (43 percent) partially supporting and 308 miles (39 percent) nonsupporting. The top three pollutants affecting water quality for this use are sedimentation/siltation, specific conductance and total dissolved solids. In comparison, the 2004 305(b) report had 696 stream miles assessed for this use and 188 miles (27 percent) fully supported, 292 miles (42 percent) partially supported this use and 187 miles (27 percent) did not (Figure 3) . Twenty-nine stream miles (four percent) were assessed full support, but threatened. Thus, there has been an overall decline in the percentage of fully supporting assessed stream miles by 13 percent (includes the four percent full support, but threatened streams) since the 2004 305(b) report.

### Little Sandy River Basin

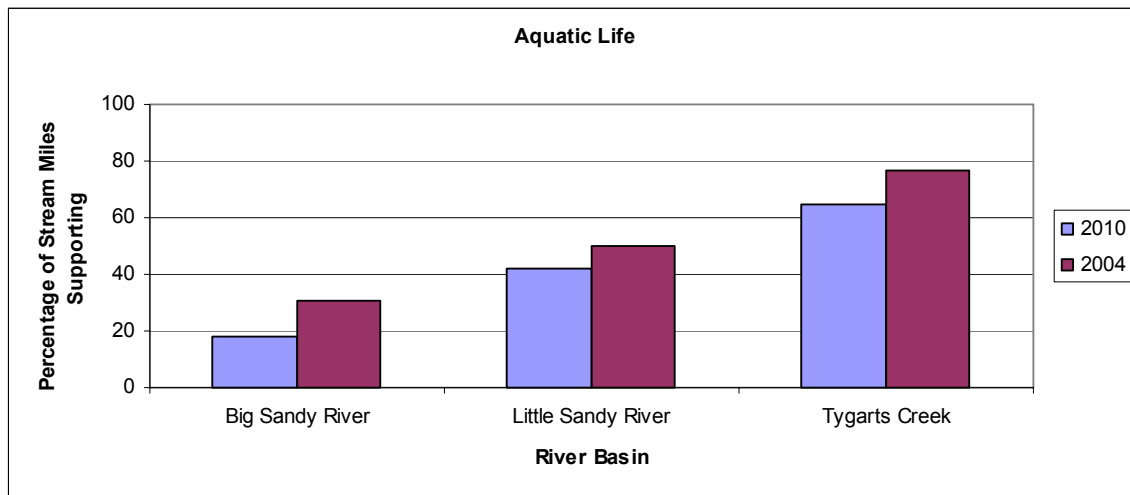
There are 231 stream miles assessed for this use in the Little Sandy River basin. Ninety-six stream miles (42 percent) fully support the use, 105 stream miles (45 percent) partially support and 29 stream miles (13 percent) are nonsupporting. The top three pollutants affecting water quality for this use are sedimentation/siltation, total dissolved solids, and cause unknown. The 2004 305(b) report listed 181 miles assessed for aquatic life use with 90 miles (50 percent) fully supporting, partially supporting were 81 miles (45 percent) and not supporting were 10 miles (6 percent) (Figure 3). The overall support decreased by eight percent as a percentage of assessed miles from 2004 to 2010. However, the number of assessed stream miles increased by 50 miles.

### Tygarts Creek Basin

Tygarts Creek is a direct tributary to the Ohio River and is the smallest basin in this BMU. There are 112 stream miles assessed for this use; 73 stream miles (65 percent) are fully supporting, 37 stream miles (33 percent) partially support and three stream miles (three percent) are nonsupporting. The top three causes (pollutants) affecting water

quality for this use are sedimentation/siltation, total dissolved solids and nutrient/eutrophication. The assessment results per the 2004 305(b) report showed nearly 77 miles were assessed and 59 (77 percent) of those miles fully supported, partially supporting were 16 (21 percent) miles and one mile (one percent) was not supporting (Figure 3). There has been a decrease in overall full support for this basin since 2004 of 12 percent of stream miles assessed. Those assessed miles increased by 35 miles per the 2010 IR results.

Figure 3. Reporting year 2004 compared to reporting year 2010 on the percentage of fully supporting stream miles assessed in the Big Sandy-Little Sandy-Tygarts BMU.



#### Big Sandy-Little Sandy-Tygarts BMU - Combined

Combining the three basins of the BMU results in 1,133 stream miles assessed for this use with 310 miles (27 percent) fully supporting, 482 miles (43 percent) partially supporting and 340 miles (30 percent) do not support the use. The top three causes (pollutants) affecting water quality for aquatic life use are sedimentation/siltation, total dissolved solids and specific conductance.

In comparison of the BMU results reported in the 2004 305(b) report, there were 954 stream miles assessed and 337 miles (35 percent) fully supported aquatic life use, partially supporting were 389 miles (41 percent) and 198 miles (21 percent) did not support. About 29 miles (three percent) were reported to be fully supporting, but threatened.

### Probabilistic Biosurvey, Big Sandy-Little Sandy-Tygarts BMU

This biological survey program differs from other monitoring programs (i.e. targeted) in the KDOW due to the random design. The random design is employed to determine the overall health, or aquatic life use support, of wadeable streams in the commonwealth. Given all streams in the defined survey population are selected by an unbiased, random method one can statistically extrapolate the results in the defined area to determine what is the condition of that stream population. This sampling method provides not only a statistically defensible summary of the condition of streams in the survey, but insight into the stressors affecting the quality of these streams.

Probabilistic biosurveys are part of the commonwealth's monitoring strategy and is conducted on the BMU level. The target population is all wadeable streams 1<sup>st</sup> through 5<sup>th</sup> Strahler stream order within the HUCs of each BMU. A frequency table is established for the population candidate streams (based on stream order) across the HUCs and based on those frequencies, a random, weighted survey design is utilized to determine those streams and locations of the sample point for the study. A sample size of 50 sites with approximately an equivalent number (based on frequency) in each of the five stream order categories: 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup>. An oversample of 200% (100 sites) for a total of 150 sites including the base sites are derived per study. This oversample provides reserve samples for alternative sites when those initial sites do not conform to target population parameters (e.g. non-wadeable, miss-mapped features), are inaccessible due to safety concerns, or to which access is denied by landowners. Standard protocol dictates that surrogate stream sample sites be selected sequentially from the oversample population when replacement of an initial sample site is necessary. Since the random design is weighted, no regard to replacement of an initial sample site with one of equivalent Strahler order is required. Macroinvertebrates (aquatic invertebrates) have been the indicator community for these surveys; additionally, select water quality variables are sampled at time of collection.

The graph below (Figure 4) depicts the percentage of wadeable streams in this BMU with level of support based on biosurvey conducted in 2007. Fully supporting stream miles is 6 percent and those stream miles not fully supporting total 94 percent. This compares with the 2002 probabilistic biosurvey that indicated 12.5 percent of stream miles fully support aquatic life and 88.5 percent did not (Figure 5). There has been some decrease in level of fully supporting stream miles over the intervening five years.

Figure 4. Proportions of aquatic life use support level in the Big Sandy-Little Sandy Tygarts basin management unit based on probability biosurveys, 2007. Pie chart represents the defined stream population (Strahler stream order 1 – 5).

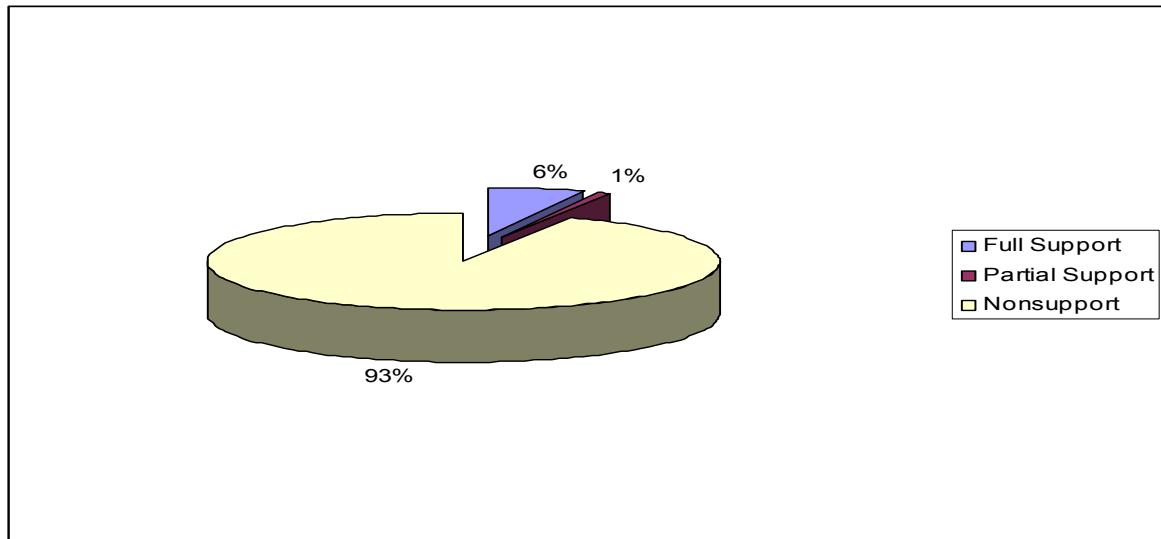
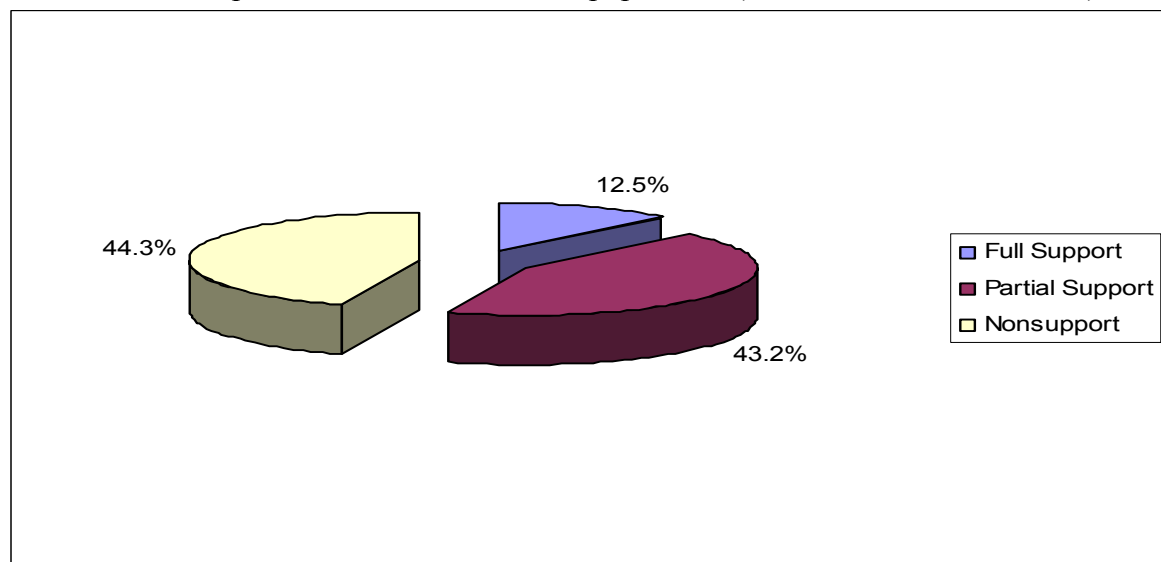


Figure 5. Proportions of aquatic life use support level in the Big Sandy-Little Sandy Tygarts basin management unit based on probability biosurveys, 2002. Pie chart represents the defined stream population (Strahler stream order 1 – 5).



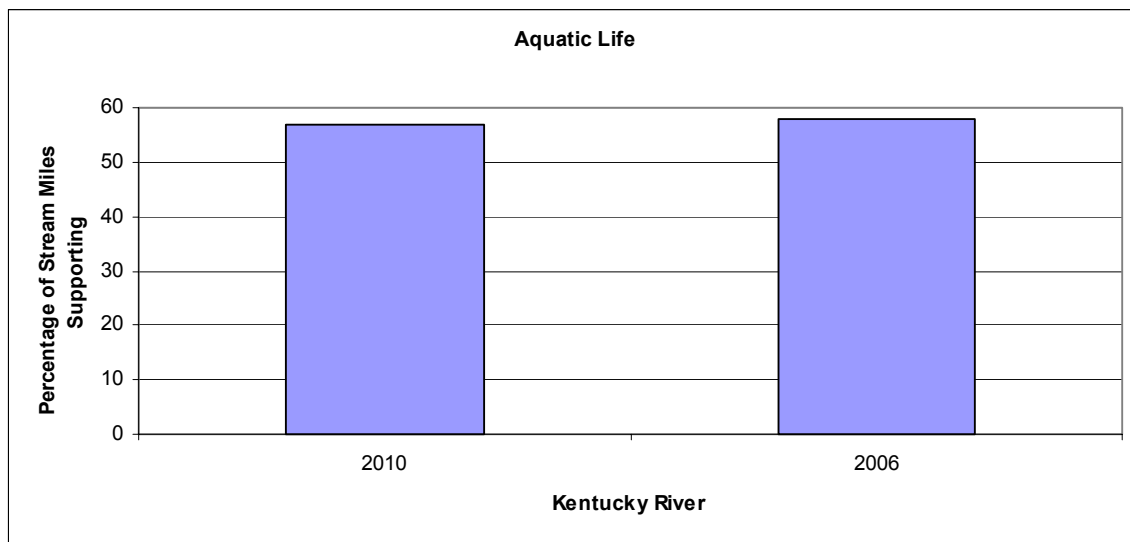
#### Kentucky River BMU

There have been 1,945 stream miles assessed for warmwater and coldwater aquatic habitat designated uses. Of those stream miles, 1,101 miles (57 percent) are fully supporting, 578 miles (30 percent) are partially supporting and 266 miles (14 percent) are



not supporting the designated uses. The top three pollutants of concern as it applies to this designated use are sedimentation/siltation, total dissolved solids and nutrient/eutrophication. According to the 2006 IR there were 1,844 stream miles assessed for aquatic life, of those 1076 miles (58 percent) were fully supporting, about 555 miles (30 percent) partially supported and 213 miles (12 percent) did not support the use. In comparing between the current reported information to the 2006 IR, the percent of fully supporting miles in this BMU have remained about the same (Figure 6).

Figure 6. Percentage of stream miles monitored that fully support aquatic life in the Kentucky River BMU, 305(b) reporting years 2006 and 2010.



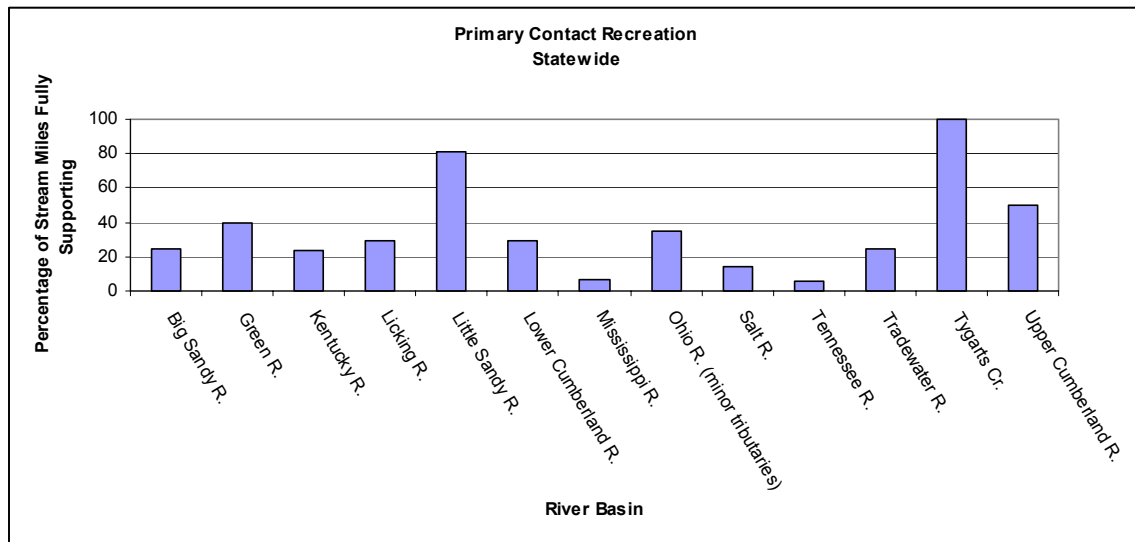
## Contact Recreation Use Support – Streams

### Statewide

Primary Contact Recreation (PCR) criteria are in-place to protect people recreating in a way that likely will result in full body immersion, such as swimming. Both bacteria and pH criteria apply to this designated use. In this report 4,762 miles have been assessed statewide for this use. A total of 1,494 miles (31 percent) fully support and 3,268 miles (69 percent) do not support the use. In comparison with results in the 2008 IR 4,493 miles were assessed and 1,346 miles (30 percent) fully supported the use and 3,148 miles (70 percent) did not fully support. Current findings indicate little change in percentage of support level between the two report cycles while assessed miles have

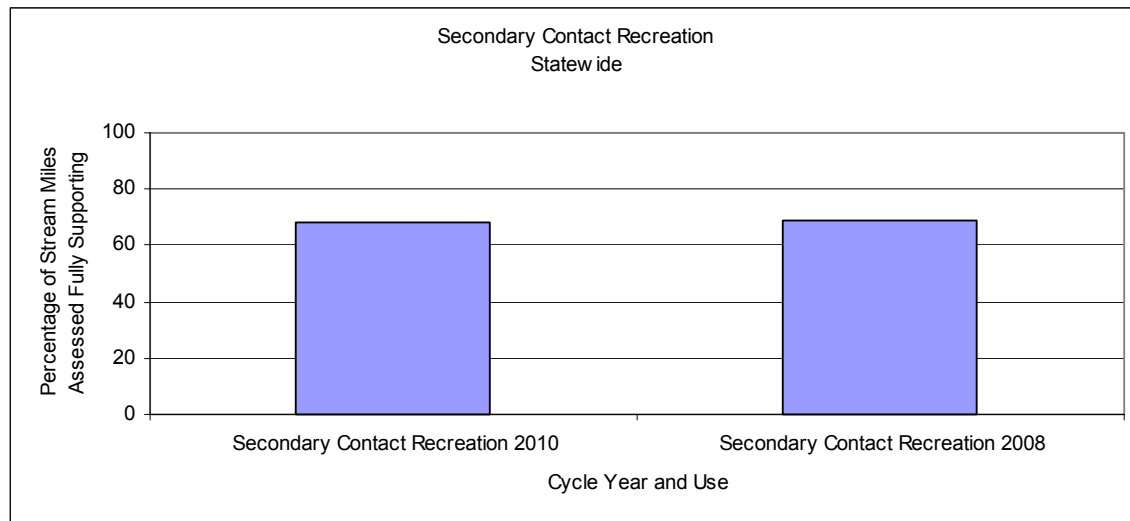
increased nearly 270 stream miles in the 2010 cycle. Figure 7 depicts the percentage of stream miles monitored and assessed for PCR in each major river basin.

Figure 7. Percentage of monitored stream miles fully supporting primary contact recreation use per the 2010 305(b) reporting cycle.



Secondary Contact Recreation (SCR) designated use criteria are in-place to protect those recreational activities that are likely to result in incidental contact with water, such as boating, fishing and wading. There have been 1,951 miles assessed for this use in the state and 1,330 miles (68 percent) fully support; a total of 621 miles (32 percent) do not fully support this use. Compared to the 2008 IR, 1,868 stream miles were assessed and 1,295 miles (69 percent) fully supported and 573 miles (31 percent) did not support the use (Figure 8). This is nearly equivalent results between the two reporting cycles.

Figure 8. Percentage of monitored stream miles fully supporting secondary contact recreation use per the 2008 and 2010 305(b) reporting cycles.



### Big Sandy-Little Sandy-Tygarts BMU

#### Big Sandy River Basin

There are 451 miles assessed for PCR use in the Big Sandy River basin in the 2010 IR. Of those stream miles, about 109 miles (24 percent) are fully supporting this designated use, 36 miles (eight percent) partially supporting and 306 miles (68 percent) not fully supporting (Figure 9). In the 2004 305(b) report the PCR results for this BMU were 223 miles assessed; of those 42 miles (19 percent) were fully supporting. No stream miles were assessed as partially supporting, but 115 miles (52 percent) were not supporting and 66 stream miles (30 percent) were assessed full support, but threatened. In this basin stream miles fully supporting has increased by five percent as a percentage of assessed miles since the 2004 305(b) cycle; however, this includes all miles that were categorized as full support, but threatened being moved to the full support category (Figure 9). Overall stream miles assessed have increased by about 230 miles over this timeframe.

Nearly 52 miles have been assessed for SCR in the Big Sandy River basin and all miles are less than full support (6 percent partially supporting [three miles] and 94 percent [49 miles] not supporting). The second leading cause (pollutant) affecting this basin is pathogens (bacteria indicators) and this directly affects use support for contact

recreation. No stream miles were assessed for SCR in this BMU in the 2004 305(b) for comparison.

#### Little Sandy River Basin

Approximately 62 stream miles are assessed in the Little Sandy River basin for PCR per the 2010 IR. Of those miles, 50 (81 percent) are fully supporting and 12 (19 percent) are not (Figure 9). Given the high rate of miles fully supporting this use no direct cause (pollutant) (pathogen indicator or pH) occurs in the top five causes affecting miles of streams in this basin. According to the 2004 305(b) report 45 miles were assessed for PCR. All but two miles (43 miles) fully supported the use (96 percent) (Figure 9). While the percentage of stream miles supporting PCR decreased per 2010 IR the miles assessed increased by 17 miles.

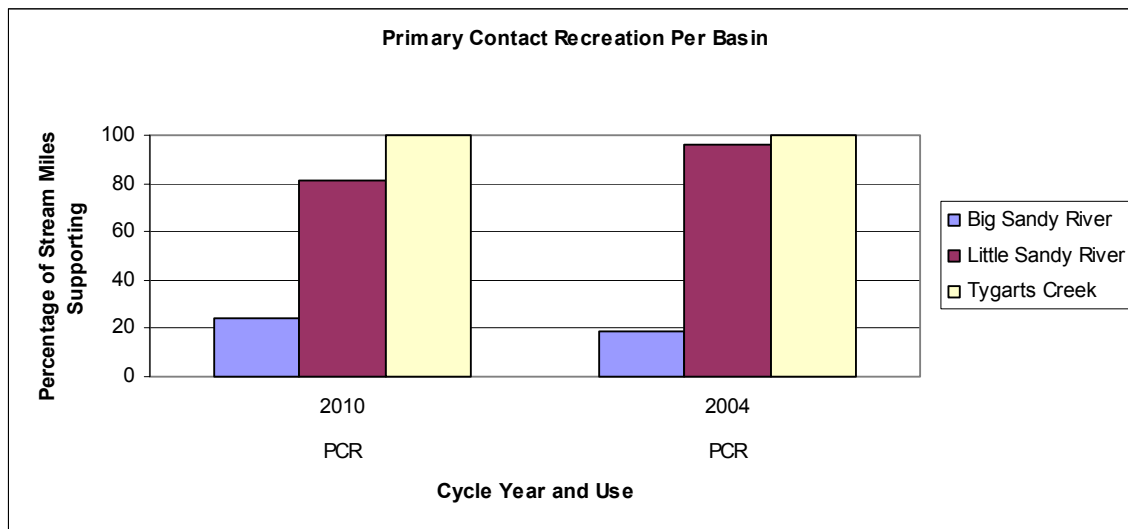
There have been no miles assessed for SCR in the Little Sandy River basin. This may be due to the fact that bacteria monitoring for PCR is now based primarily on the pathogen indicator *Escherichia coli* rather than fecal coliform, and no pH measurements exceed water quality standards for the use.

#### Tygarts Creek Basin

In the Tygarts Creek basin almost 56 miles are assessed for PCR. All stream miles (100 percent) fully support this use. This compares to 100 percent of 16.5 miles assessed fully supporting per the 2004 305(b) report (Figure 9).

Secondary Contact Recreation has not been assessed in this basin. As with the Little Sandy River basin a change in monitored bacteria indicators and no pH conditions exceeding water quality standards are reasons for this result.

Figure 9. Comparison of percentage of monitored stream miles fully supporting primary contact recreation use between the 2004 and 2010 305(b) reporting cycles for the Big Sandy-Little Sandy-Tygarts BMU.

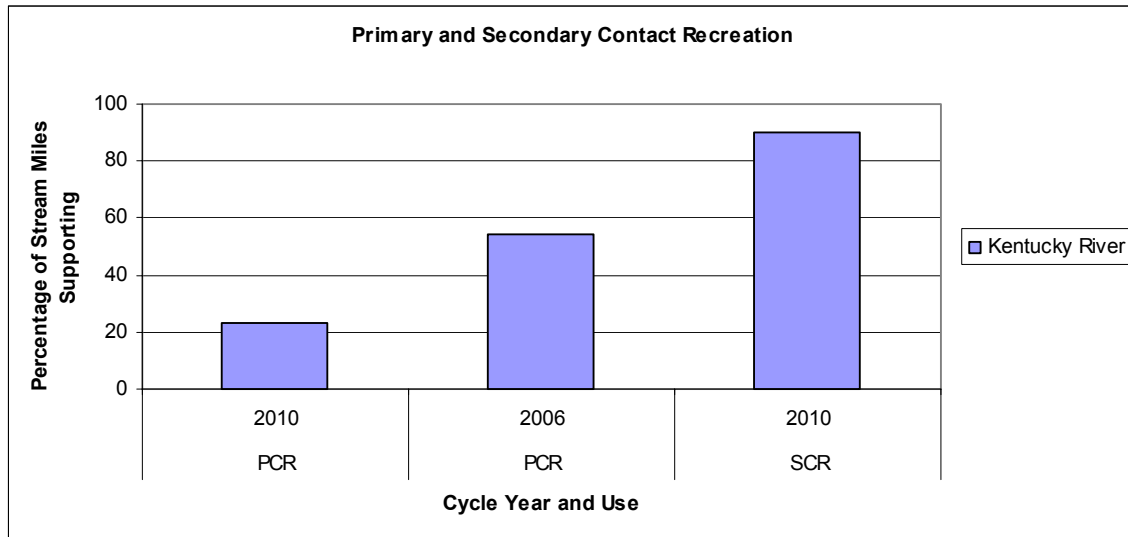


#### Kentucky River BMU

Approximately 939 stream miles are assessed for PCR in this BMU with about 219 miles (23 percent) fully supporting (Figure 10). This is in contrast to 179 miles (19 percent) partially supporting and nearly 542 miles (58 percent) not supporting this use per 2010 305(b) reporting cycle. Pathogens are the most frequent cause (pollutant) identified affecting the most miles in this basin. Compared to the 2006 IR there were 646 stream miles assessed for PCR, 349 miles (54 percent) fully supported (Figure 10), 146 miles (23 percent) partially supported and 152 miles (24 percent) did not support the use. As a percent of stream miles assessed the level of support has declined 31 percent; stream miles assessed increased from 2006 to 2010 IR cycle by about 300 miles.

Approximately 444 stream miles have been assessed in this BMU for SCR with nearly 399 miles (90 percent) fully supporting the use (Figure 10). Partially supporting the use are nine miles (two percent) and 37 miles (eight percent) not supporting SCR.

Figure 10. Comparison of percentage of monitored stream miles fully supporting primary contact recreation use between the 2006 and 2010 305(b) reporting cycles.



## Fish Consumption

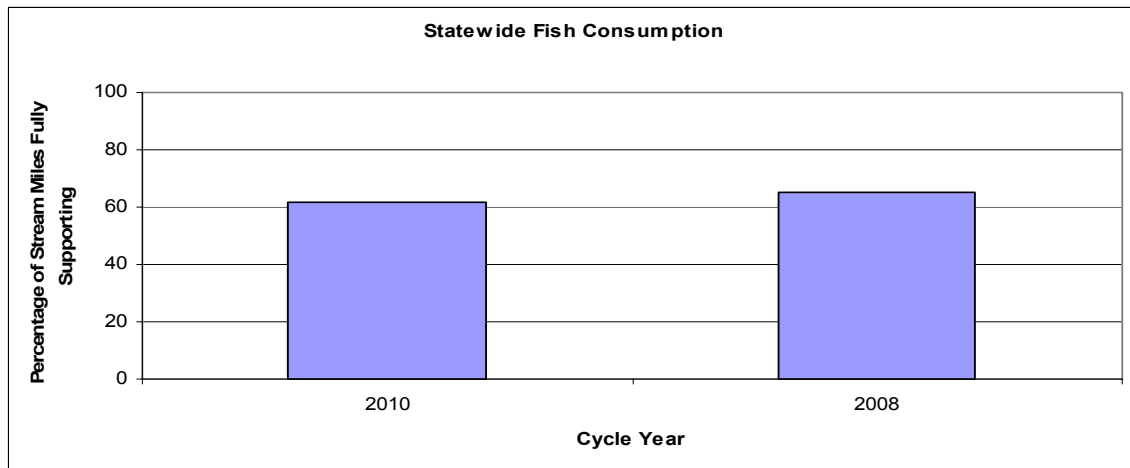
### Statewide

Fish consumption is not a designated use in Kentucky water quality standards, but the use is implied in 401 KAR 10:031 Section 2 and through human health criteria in Section 6. Twelve hundred ten stream miles have been assessed for fish consumption and 754 miles (62 percent) fully support (Figure 11). Not supporting are 456 miles (38 percent), primarily due to mercury in fish tissue. In the 2008 IR there were 1245 stream miles reported as assessed with 805 of those miles (65 percent) fully supporting (Figure 11). Not supporting fish consumption was 440 miles (35 percent). With nearly as many miles assessed between the two reports the data indicate approximately the same level of support.

There is a statewide fish consumption advisory that differs from fish consumption assessed to determine whether this implied use is supporting or not based on monitored data. The latter is based on water body specific monitoring and comparing the fish tissue body burden results for specific pollutants (e.g. mercury, PCB, chlordane) in our water quality standards that apply. The advisory is a precautionary alert for those sensitive populations (children six years and younger and women of childbearing age) to consider

limiting their consumption of fish to no more than one meal (a meal is considered eight ounces) per week. This advisory was issued on April 11, 2000 because of low levels of mercury found in fish tissue statewide.

Figure 11. Comparison of stream miles monitored and that fully support fish consumption between the 2008 and 2010 305(b) reporting cycles.



### Big Sandy River Basin

Seventy-seven stream miles are assessed for the Big Sandy River basin with 54 miles (70 percent) fully supporting (Figure 12). Partially supporting fish consumption are 15 miles (20 percent) and eight miles (10 percent) are not supporting. Mercury and PCB (polychlorinated biphenyls) in fish tissue are the primary pollutants of concern in this basin for fish consumption. When compared to the 2004 305(b) results 79 stream miles (83 percent) out of 95 miles fully supported PCR (Figure 12). Sixteen miles (17 percent) did not support this use. With nearly equal miles assessed between the two cycles the support level has changed, decreasing 13 percent.

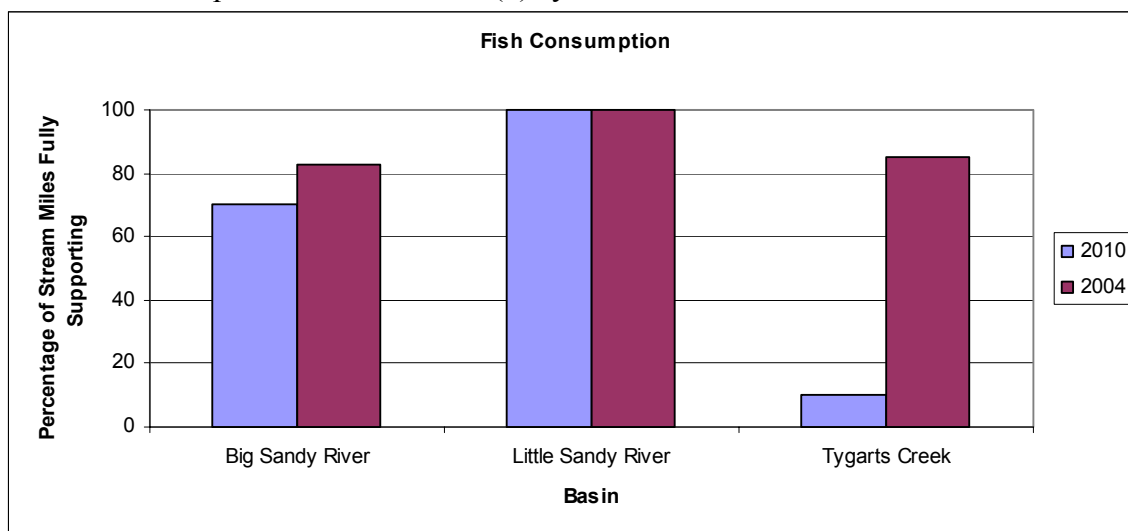
### Little Sandy River Basin

Of the eight stream miles assessed for fish consumption in the Little Sandy River basin, all are fully supporting (Figure 12). These results have not changed since the last reporting cycle in 2004.

### Tygarts Creek

The Tygarts Creek basin has 51 stream miles assessed for fish consumption. Of those miles, about five miles (10 percent) fully support (Figure 12). There are no partially supporting stream miles and 45 miles (88 percent) do not support fish consumption. The pollutants of concern in this basin are mercury and PCB. In the 2004 305(b) report 13 stream miles were assessed, 11 miles (85 percent) fully supported the use (Figure 12) and two miles (15 percent) did not support. While the stream miles assessed have increased (38 miles) the percentage of assessed miles fully supporting has decreased by 75 percent.

Figure 12. Monitored and assessed stream miles fully supporting fish consumption in the Big Sandy, Little Sandy and Tygarts basins; 2004 305(b) reporting cycle compared to the 2010 305(b) cycle.

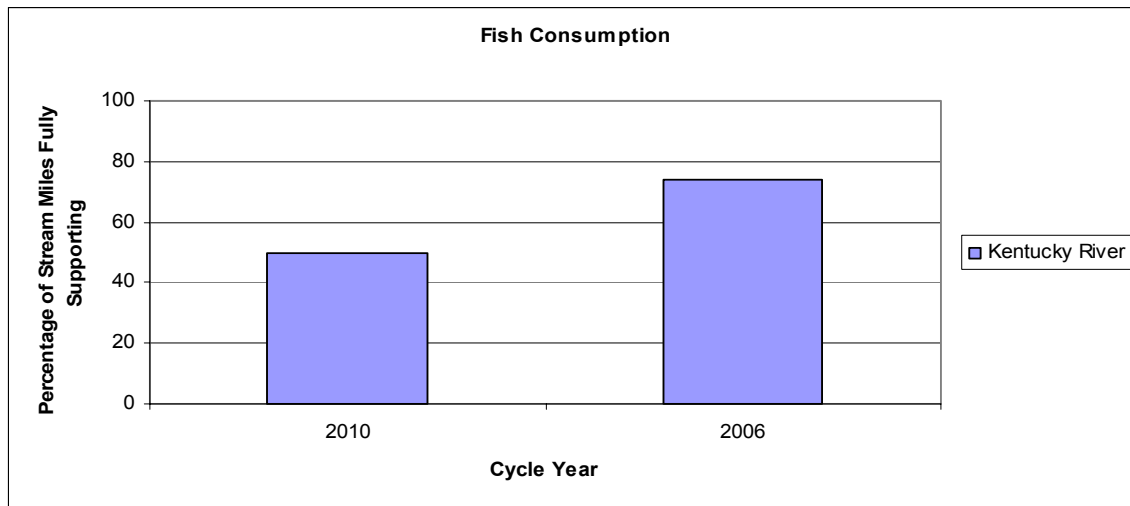


### Kentucky River BMU

Nearly 308 steam miles have been assessed for fish consumption in this BMU. Of those, 153 miles (50 percent) fully support (Figure 13), 143 miles (46 percent) partially support and 11 miles (4 percent) do not support fish consumption. Mercury in fish tissue is the pollutant of concern in this BMU. In the 2006 IR there were 326 miles assessed and 241 miles (74 percent) fully supported (Figure 13), 74 miles (23 percent) partially supported and 11 miles (three percent) were nonsupporting. The miles of assessed waters fully supporting have decreased by 24 percent per the 2010 IR.



Figure 13. Comparison between the 2006 and 2010 305(b) cycles of stream miles monitored and assessed that fully support fish consumption.

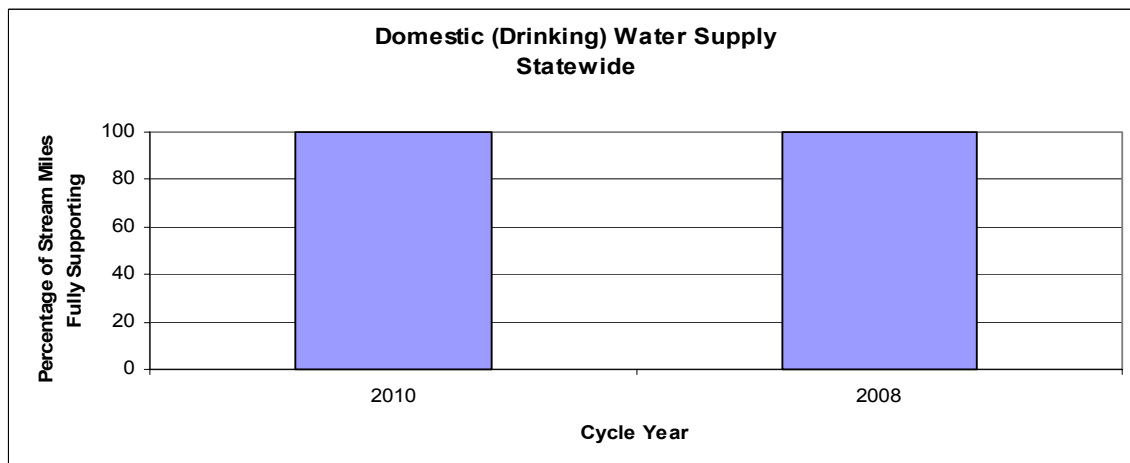


## Domestic (Drinking) Water Supply

### Statewide

All stream miles fully support domestic (drinking) water supply use (Figure 14). Where this designated use has been implemented (point of withdrawal) an associated 689.5 stream miles have been assessed. Given all stream miles in the commonwealth fully support this designated use no individual basin report occurs in the executive summary. All streams fully supported this use per the 2008 IR.

Figure 14. Comparison between the 2008 and 2010 305(b) reporting cycles of stream miles monitored and assessed for domestic water supply use.

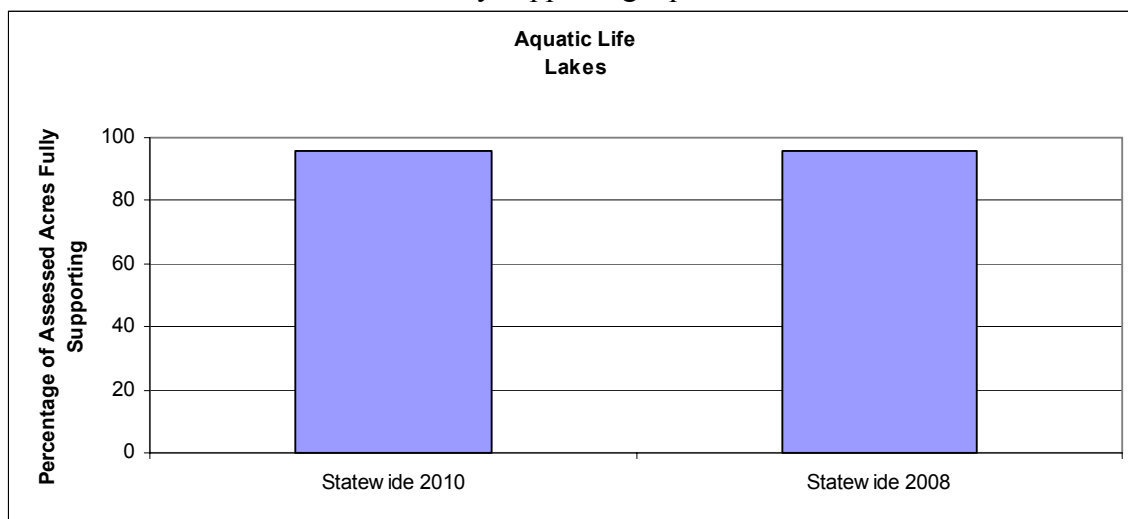


## Warmwater and Coldwater Aquatic Habitat Use Support – Lakes

### Statewide

About 98 percent (nearly 218,000 acres) of publicly owned reservoir, lake and pond (hereafter referred as lakes) acres have been assessed for at least one designated use, primarily aquatic life. Of the 220,005 acres of publicly owned lakes assessed for this use, 211,448 acres (96 percent) fully support aquatic life use (Figure 15). Nearly 8,560 acres (4 percent) are not supporting this use. The top three pollutants affecting lakes for this use are, nutrient/eutrophication, pH and dissolved oxygen. These results are comparable to the support level reported in the 2008 IR that also showed the same percentage (96 percent) of assessed lake acreage supporting this use (Figure 15). Since the 2008 IR cycle, the number of assessed acreage increased about 9,000 acres.

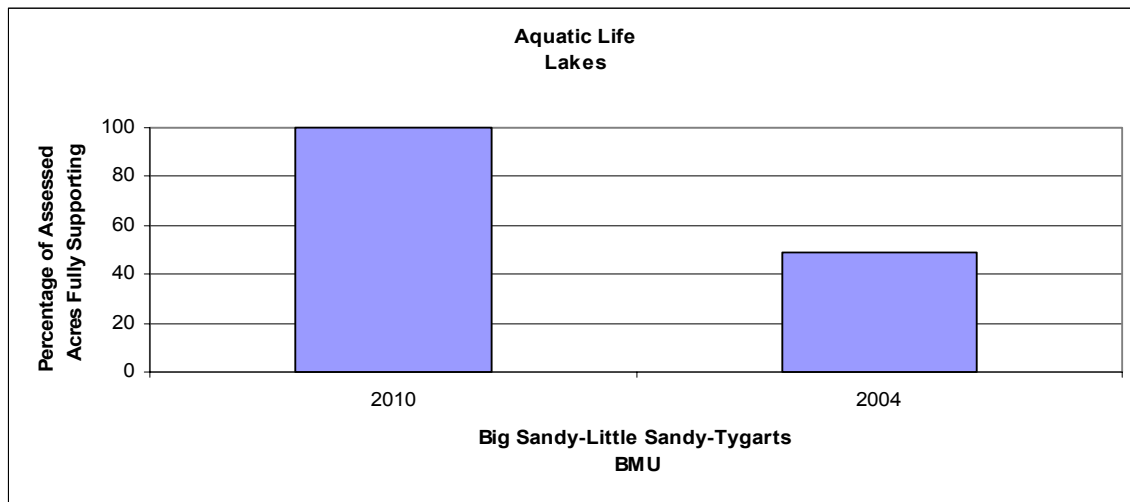
Figure 15. Statewide comparison between the 2008 and 2010 305(b) reporting cycles of monitored lake acres fully supporting aquatic life use.



### Big Sandy-Little Sandy-Tygarts BMU

Of the 7,383 acres assessed for designated uses, 100 percent of those acres fully support aquatic life use (Figure 16). This compares to 3,625 lake-acres (49 percent) supporting this use in the 2004 305(b) report (Figure 16). This is an important increase in lake resources fully supporting.

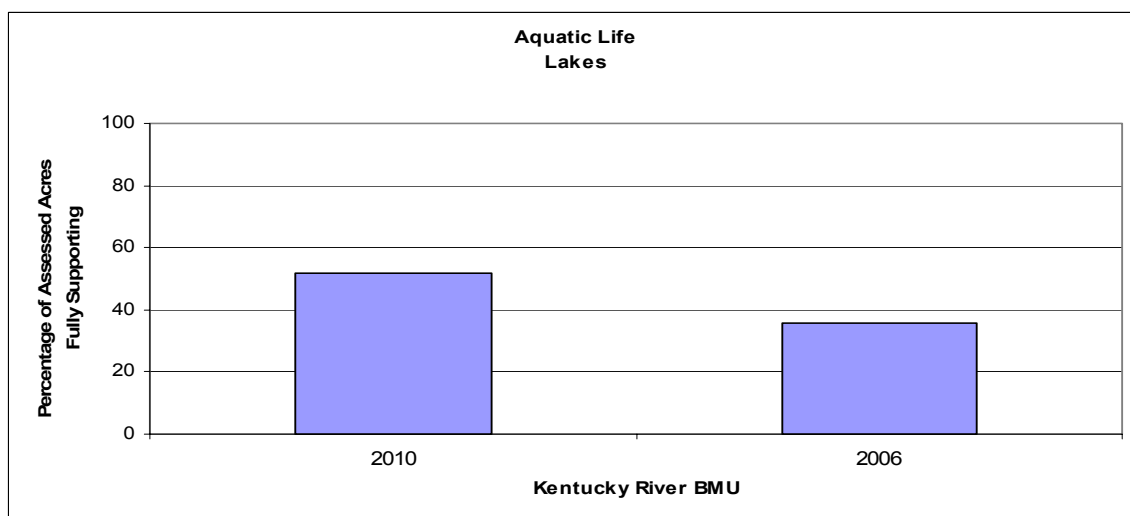
Figure 16. Comparison between the 2004 and 2010 305(b) reporting cycles of lake acres monitored and assessed that fully support aquatic life use in the Big Sandy-Little Sandy-Tygars BMU.



#### Kentucky River BMU

There are 5,965 lake-acres assessed in this BMU for this use, 3,113 acres (52 percent) are fully supporting (note this includes acreage proposed for delisting based on current data results). As a percentage of assessed acres, lake-acres fully supporting have increased by about 16 percent (from 36 percent) since the 2006 IR results for this BMU (Figure 17).

Figure 17. Comparison between the 2006 and 2010 305(b) reporting cycles of lake acres monitored and assessed that fully support aquatic life use in the Kentucky River BMU.



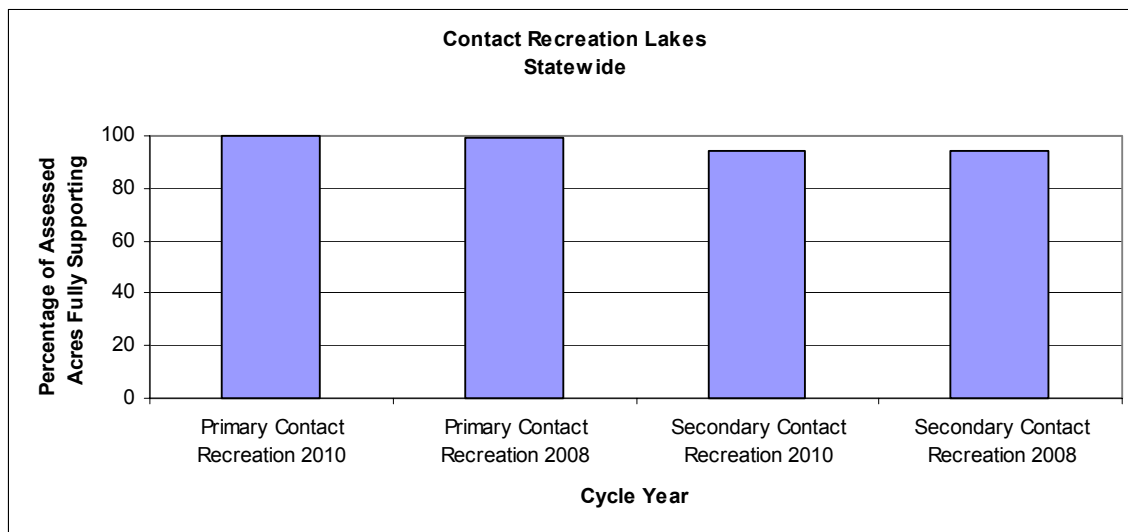
## Contact Recreation Use Support

### Statewide

Primary contact recreation acreage reported in 2010 is 62,149 acres and all those acres are fully supporting the use. This compares to 62,149 acres assessed per the 2008 IR with 61,930 acres (nearly 100 percent) supporting the use (Figure 18).

Approximately 217,337 acres are assessed for SCR and about 204,936 acres (94 percent) fully support this use. This compares to 213,497 acres assessed and 200,773 acres (94 percent) fully supporting per the 2008 IR (Figure 18).

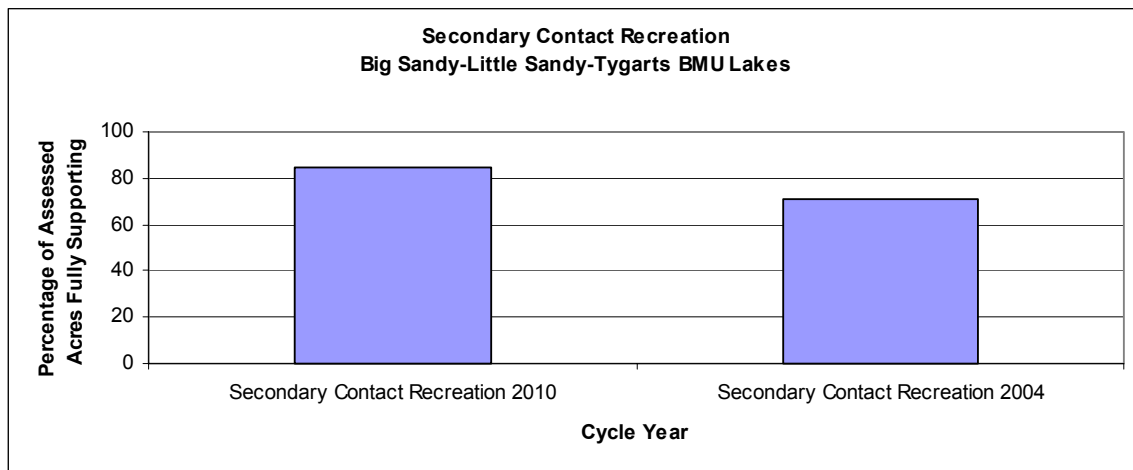
Figure 18. Statewide comparison between the 2008 and 2010 305(b) reporting cycles of lake acres monitored and assessed that fully support primary and secondary contact recreation.



### Big Sandy-Little Sandy-Tygarts BMU

In this BMU 7,353 acres are assessed for SCR and 6,253 acres (85 percent) fully support (Figure 19). This compares to 3,755 acres assessed in the 2004 305(b) report with 2,655 acres (71 percent) fully supporting (Figure 19). This is considerable increase in both use support and acreage assessed in the 2010 IR cycle. As explained in the report PCR has not been monitored in lakes for this BMU.

Figure 19. Comparison between the 2004 and 2010 305(b) reporting cycles of lake acres monitored and assessed that fully support secondary contact recreation in the Big Sandy-Little Sandy-Tygarts BMU.

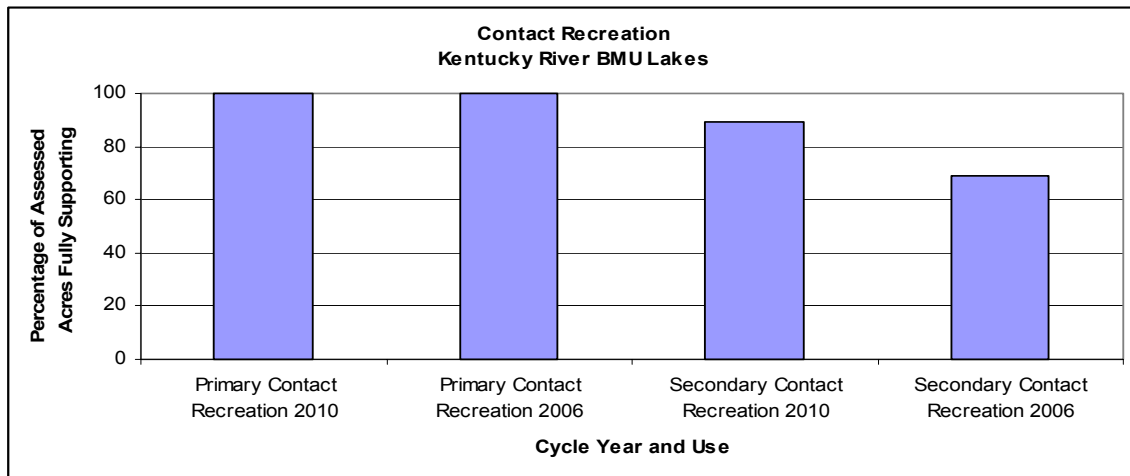


#### Kentucky River BMU

No new lake acres were assessed in 2010 for PCR in this BMU. Due to a special project on Herrington Lake, the 2006 305(b) report documented 2,940 acres assessed and fully supporting PCR (Figure 20).

Secondary contact recreation is typically assessed at all lakes where this use is allowed (this use is restricted at some domestic water supply lakes). The 2010 IR results show 5,948 acres (89 percent) out of 6,658 acres assessed for this use are fully supporting. According to information in the 2006 IR 6,885 acres were assessed for SCR and 4,776 (69 percent) acres fully support (Figure 20). The 2010 IR information show an increase in percentage of assessed acreage fully supporting this use of nearly 20 percent.

Figure 20. Comparison between the 2006 and 2010 305(b) reporting cycles of lake acres monitored and assessed that fully support primary and secondary contact recreation in the Kentucky River BMU.

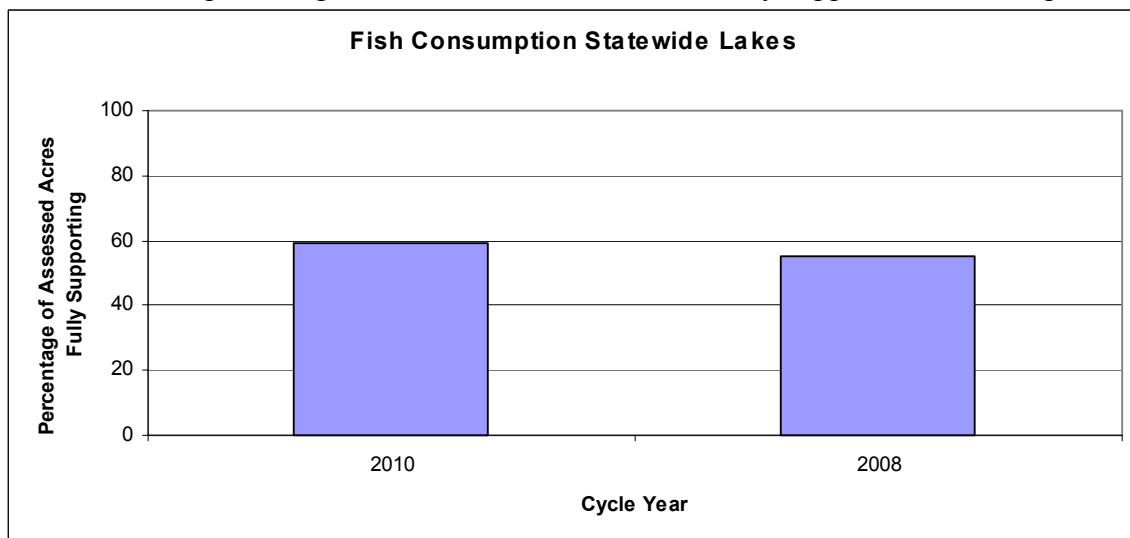


## Fish Consumption

### Statewide

Fish consumption acreage assessed is 205,635 with 122,247 acres (59 percent) fully supporting. In comparison to the 2008 IR, 204,732 acres were assessed and 112,212 acres (55 percent) fully supported (Figure 21). The 2010 IR data show an increase in supporting lake acreage of four percent.

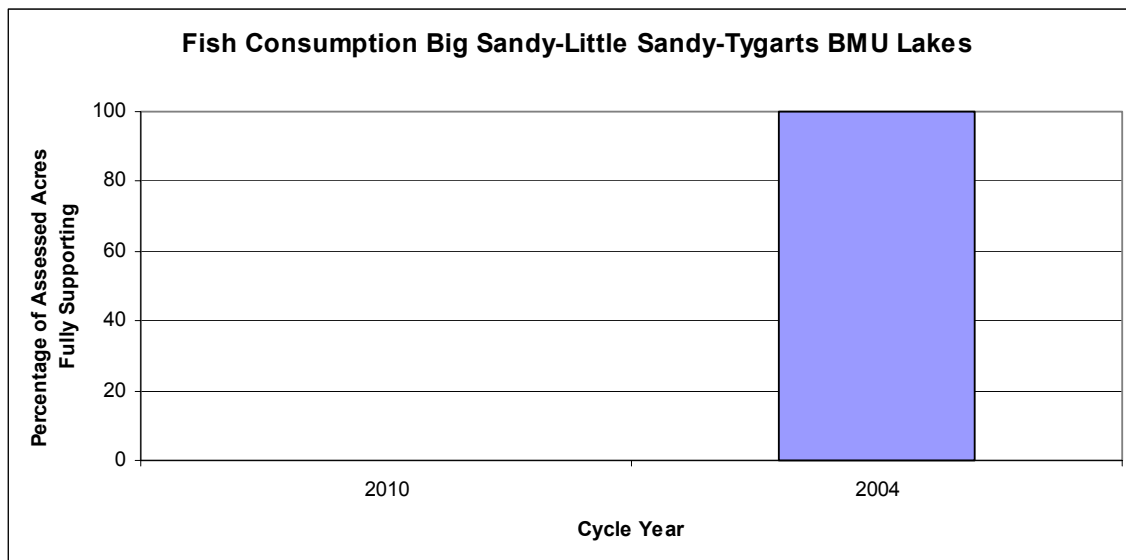
Figure 21. Statewide comparison between the 2008 and 2010 305(b) reporting cycle for the percentage of monitored lake acres that fully support fish consumption.



### Big Sandy-Little Sandy-Tygarts BMU

Assessed acres for this BMU are 3,794 and all those acres are less than full support for fish consumption. This compares to the 2004 305(b) report of 1,089 acres assessed and 100 percent of those acres fully supported (Figure 22). The pollutants of primary concern for this use are mercury and PCB in fish tissue.

Figure 22. Comparison between the 2004 and 2010 monitored lake acres that fully support fish consumption in the Big Sandy-Little Sandy-Tygarts BMU.



### Kentucky River BMU

Approximately 4,440 acres were assessed in the 2010 IR, of those acres all are less than full support. Compared to the 2006 IR, 3,724 acres were assessed and all those acres did not fully support fish consumption. The pollutant of concern in this BMU is mercury in fish tissue.

### **Statewide Water Quality Trends**

Water quality trends analysis was performed on 37 of the KDOW's ambient stations with the longest record, 1979-2004. These stations were monitored on a monthly frequency until 1998 when the KDOW implemented a rotating basin management unit strategy. Once this plan was implemented the ambient stations were expanded to 70 statewide with sampling frequency bimonthly, except once every five years when those

stations within the BMU undergoing intensive monitoring revert to monthly sampling for the water-year (April through March).

Trends for surface water-quality were analyzed for 15 water quality properties. Analyses were performed for physical properties (temperature, pH, dissolved oxygen, specific conductance, hardness and suspended solids), major ions (sulfate and chloride), selected metals (total iron and total manganese) and nutrients (total phosphorus, total nitrogen, nitrite-nitrate and total Kjeldahl nitrogen). Flow-adjustment procedures were employed at all stations to remove the effects of streamflow on water quality variability. A decreasing trend indicates a decrease in concentration of a particular water quality property, and an increasing trend indicates an increase in concentration of a particular water quality property.

Water quality trends varied statewide by station and physical or chemical constituent. Results for all stations had a significant trend if at least one water quality property had a statistically significant ( $p$ -value  $<0.05$ ) increasing or decreasing trend during the period specified. Water temperature or dissolved oxygen had no significant decreasing trend at any station. Water temperature had one significant increasing trend at the South Fork Cumberland River near Blue Heron. Specific conductance and concentrations of hardness had one significant decreasing trend at South Fork Cumberland River near Blue Heron. pH had a significant decreasing trend at the Mud River near Gus. Concentrations of total suspended solids had one increasing trend at the Kentucky River at High Bridge and decreasing trends at five stations located in the Cumberland River basin.

Chloride concentrations at the 37 stations had increasing trends at 15 stations, decreasing trends at three stations and no significant trend in concentration at 19 stations. Most of the increasing trends were located at stations in the northern part of the state. Increasing trends of sulfate concentrations were detected at seven stations, all these stations were located in the Appalachian Region.

Total iron concentrations had significant increasing (one station) and decreasing (four stations) trends in various locations in east Kentucky. Tygarts Creek near Lynn had a significant increasing trend in total iron. Concentrations of total manganese had increasing trends at two stations, decreasing trends at 13 stations and no significant trend



at 22 stations. All six ambient stations in the Cumberland River basin had decreasing concentrations of total manganese.

Trends analysis for all nitrogen constituents analyzed for had no trends at 25 stations. Concentrations for total nitrogen had two significant increasing trends at the Little Sandy River at Argillite and at the Little River near Cadiz. Concentration analysis for total phosphorus had 14 decreasing trends and four increasing trends. Three of the four stations with increasing trends were in the Kentucky River basin, while the other station was at the Green River near Woodbury in the Green River basin.

## **II. Section 303(d), Volume II**

Volume II of the IR addresses the section of the Clean Water Act requiring states to submit a list of waters impaired for any designated use. Specifically, the 303(d) list is a subset of the 305(b) list of assessed waters; those requiring a TMDL (total maximum daily load) be developed for each pollutant that exceeds water quality criteria. The TMDL is a calculation of the total amount of a pollutant a water body can assimilate while meeting applicable designated uses (warmwater and coldwater aquatic habitat; primary and secondary contact recreation; domestic water supply; outstanding state resource water; and fish consumption [an implied use]). For the 2010 IR cycle there are 2,418 pollutant-water body combinations (PWC). Currently, 74 TMDLs are scheduled for completion during federal fiscal year (FFY) 2010 and 185 in FFY 2011. There are over 600 pollutant-water body combinations presently under development. As of time of this report, EPA has approved 289 PWC. Based on current monitored data the KDOW is requesting 144 PWC be delisted given current results. If EPA denies any of these requests the water bodies and associated pollutants will be maintained on the 303(d) list requiring development of a TMDL. Figure 23 indicates the various stages of the TMDL process (including requested delistings) statewide for Kentucky.

Figure 22. Status of the TMDL process in Kentucky through the 2010 Integrated Report cycle.

